Snowfall Observations in Marquette MI using GMI GPROF and a Precipitation Gauge Network

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Introduction & Motivation:

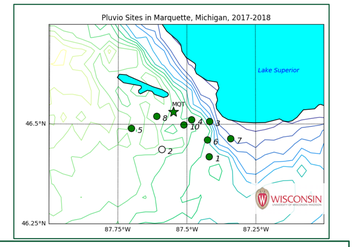
- Marquette, MI (MQT) is situated just south of Lake Superior in the Upper Peninsula and is subject to heavy, lake-enhanced snow storms
- Accurately forecasting these snow storms is of the utmost importance to the National Weather Service office in MQT, as are precise measurements of snow
- A network of ground-based measurements (Pluvios) combined with space-based estimates (GPM GPROF) of precipitation allows for insight of high-impact winter storms

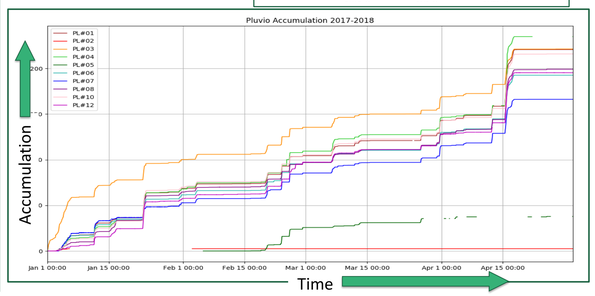
Data & Methods

- Ott Pluvios: weighing gauges that measure precipitation accumulation
- GPM: Goddard Profiling (GPROF) Algorithm V05B uses brightness temperatures (T_B) from GPM Microwave Imager (GMI) to search an *a priori* database of matched T_B and precipitation estimates
- January 1 2018 – April 30 2018. Used -9/+10 minutes from overpass:

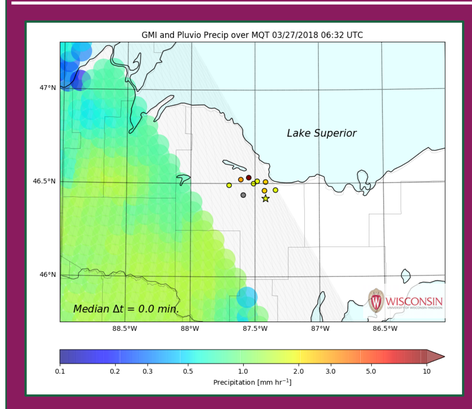
	Pluvio	GMI
Accumulation [mm]	Sum of Pluvio data over 20 minutes.	Convert mm hr^{-1} to mm $20min^{-1}$
Mean Snow Rate [mm hr^{-1}]	Average Pluvio data over 20 minutes, then convert mm min^{-1} to mm hr^{-1}	-

★ = National Weather Service MQT Office Pluvio



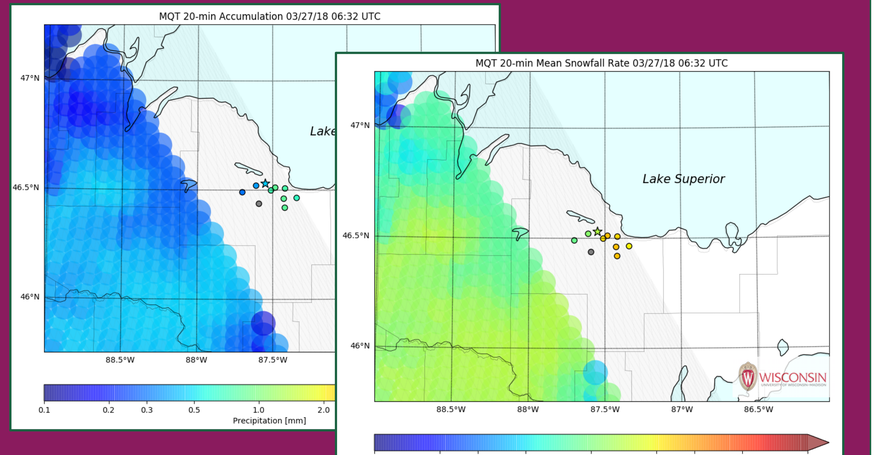


Pluvio & GPM Time-Matching



- Using the overpass time (see left figure), a direct time-match may not be best, given the different perspectives (space vs. ground) of observations.
- Using a range of data around the overpass time can help.
- Occasionally, Pluvio data was unavailable at the overpass time. Δt describes time difference between the overpass time and pluvio observation.

Using a range of time (right figures) allows a more appropriate comparison and dampens the impact of differences in time of overpass and Pluvio observations.



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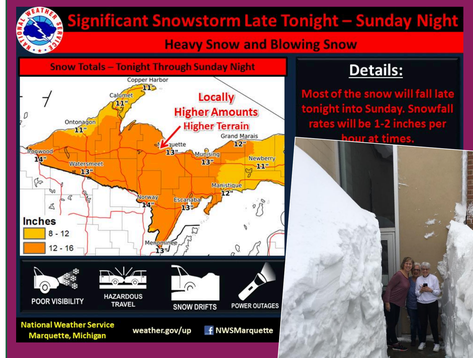
April Winter Storm (April 13-16 2018)

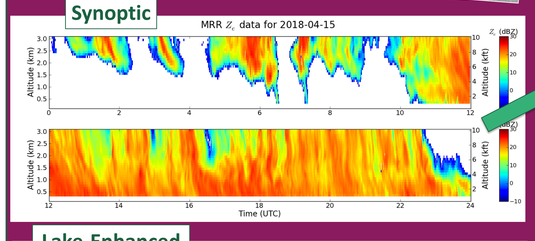
weather.gov/mqt/AprilWinterStorm



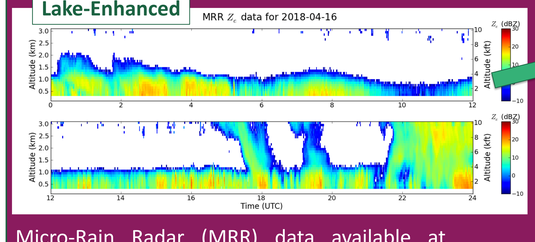
Snow Drifts at YMCA Marinette-Menominee (via NWS)

- Comparing two very different types of datasets is difficult but qualitatively shows similar results
- Future work includes incorporating the Precipitation Imaging Package (PIP) and additional winter seasons' data

Synoptic

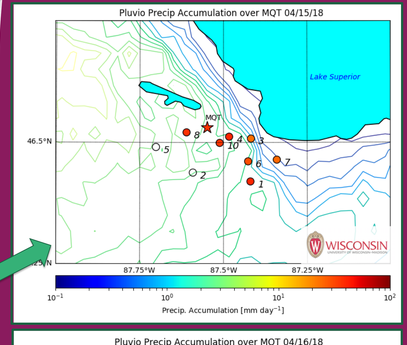


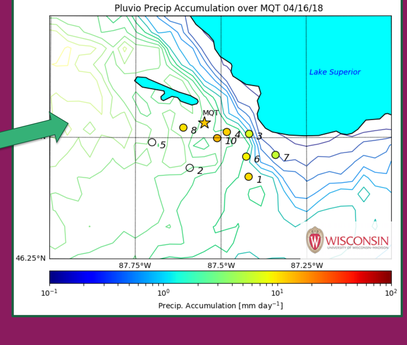
Lake-Enhanced



Micro-Rain Radar (MRR) data available at https://www.ssec.wisc.edu/lake_effect/mqt/

Daily Accumulations





Mean Snow Rate